

## Figure Captions

- Fig. 1. Structure Comparisons of (c) the proposed IGBT with (a) PT-IGBT and (b) NPT-IGBT.
- Fig. 2. The key process steps for the new-structure IGBT fabrication.
  - (a) Double-side ultra-deep phosphorus diffusion;
  - (b) MOSFET cells fabrication after complete removal of the front side diffusion layer;
  - (c) Grinding from backside
  - (d) Transparent P<sup>+</sup> emitter fabrication by boron implantation.
- Fig. 3. Simulated excess-carrier profiles in the n<sup>-</sup>-base regions of the new structure IGBT and NPT-IGBT during on-state.
- Fig. 4. Spreading Resistance Probing (SRP) analysis results from the backside of the fabricated sample.
- Fig. 5. Measured collector-emitter breakdown curves of the fabricated new-structure IGBT sample and the fabricated NPT-IGBT sample.
- Fig. 6. Measured inductive turn-off curves of the fabricated new-structure IGBT sample with  $V_{CC}$ =1100V,  $I_C$ =15A, L=3mH,  $R_g$ =150 $\Omega$ .
- Fig. 7. Trade-off curves for the new structure IGBT and NPT-IGBT.



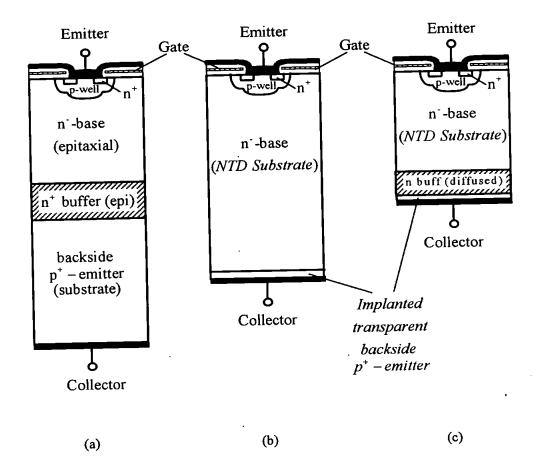


Fig. 1: X. Cheng et al.



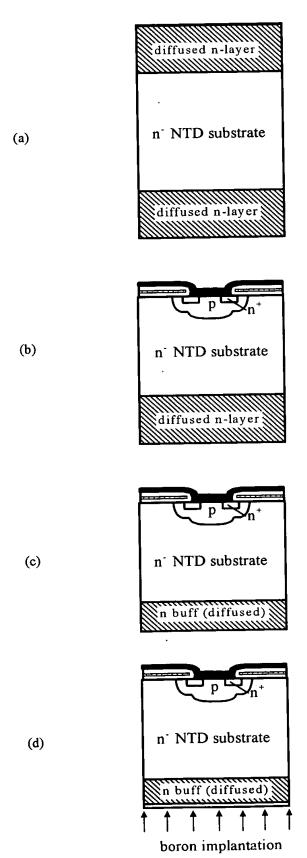


Fig. 2: X. Cheng et al.



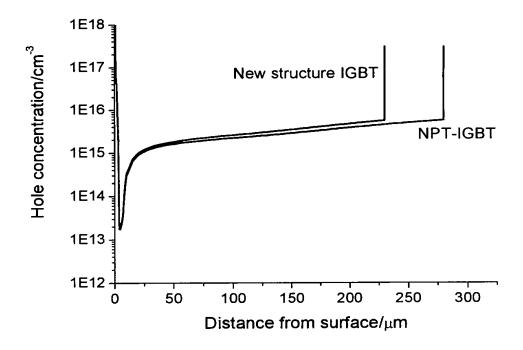


Fig. 3: X. Cheng et al.



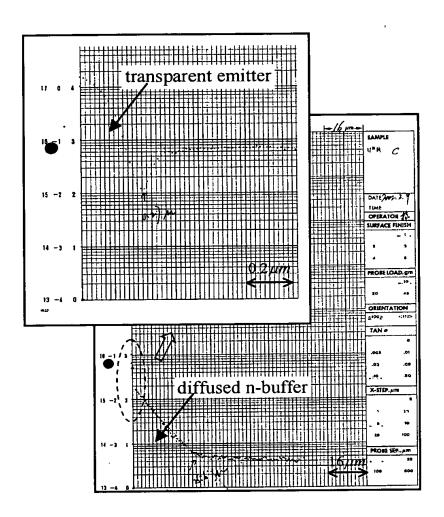


Fig. 4: X. Cheng et al.



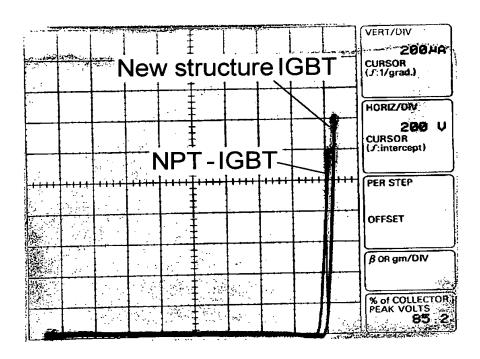


Fig. 5: X. Cheng et al.



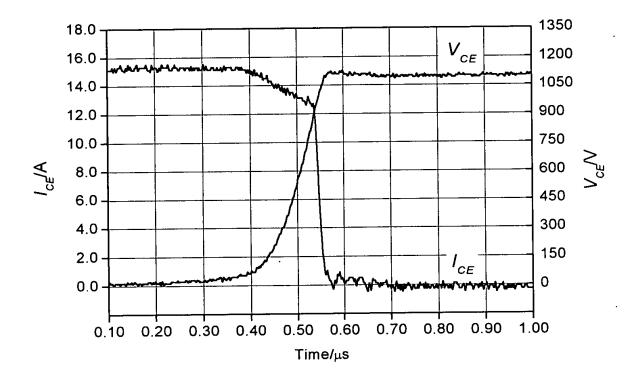


Fig. 6: X. Cheng et al.



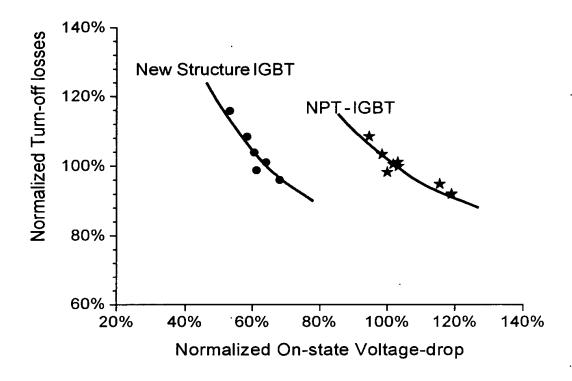


Fig. 7: X. Cheng et al.